

Description of *Ceratophysella robustiseta* sp. n. from greenhouses in England, with notes on synonymy of *C. postantennalis* Yosii, 1966 and taxonomic status of *C. morula* Deharveng & Bourgeois, 1991 (Collembola: Hypogastruridae)

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Description of *Ceratophysella robustiseta* sp. n. from greenhouses in England, with notes on synonymy of *C. postantennalis* Yosii, 1966 and taxonomic status of *C. morula* Deharveng & Bourgeois, 1991 (Collembola: Hypogastruridae). - *Ceratophysella robustiseta* sp. n. from greenhouses in Kew Gardens (London, England) is described. Notes on morphology and taxonomic status of a related species *Ceratophysella morula* Deharveng & Bourgeois, 1991 are given. *Ceratophysella postantennalis* Yosii, 1966 is synonymized with *Hypogastrura nepalica* Yosii, 1966, syn. n.

Keywords: Collembola - Hypogastruridae - *Ceratophysella* - taxonomy.

INTRODUCTION

The large genus *Ceratophysella* Börner, 1932 comprises three species with a moruliform postantennal organ: *C. mosquensis* (Becker, 1905) from Europe, *C. postantennalis* Yosii, 1966 from Nepal, and *C. morula* Deharveng & Bourgeois, 1991 from Thailand. The first species mentioned is well known and widely distributed (Babenko *et al.*, 1994) while the two latter ones are known from the type locality (*C. morula*) or some localities only (*C. postantennalis*). During visit in Kew Gardens greenhouses in London several specimens which generally resemble *C. postantennalis* and *C. morula* were found. A comparison with the type material of these species made it possible to ascertain that the English specimens represented a new species, *C. morula* requires taxonomic comments and *C. postantennalis* is synonymous with *Hypogastrura nepalica* Yosii, 1966.

RESULTS AND DISCUSSION

Hypogastrura nepalica Yosii, 1966

Ceratophysella postantennalis Yosii, 1966 **syn. n.**

MATERIAL EXAMINED: Holotype - specimen in alcohol, Maedane Karka, East Nepal, 10.VI. 1963, leg. Yasuda; paratypes - 6 specimens on slides (formerly in alcohol), same data as holotype. All material deposited in the Muséum d'histoire naturelle in Geneva.

Holotype of *Ceratophysella postantennalis* - male on slide (formerly in alcohol), Nepal, Maedane Karka, 10-12.VI.1963, leg. Yasuda, det. Yosii; paratypes - 9 specimens on slides (formerly in alcohol), Nepal, Maedane Karka, 10.VI.1963, m-2, leg. Yasuda, det. Yosii 1983; 2 specimens on slides (formerly in alcohol), Nepal, Maedane Karka, 12.VI.1963, m-6, leg. Yasuda, det. Yosii 1983. All material deposited in the Muséum d'histoire naturelle in Geneva.

REMARKS

C. postantennalis was described from Maedane Karka (the Rolwaling Himal, East Nepal) on the basis of specimens with distinct morphological features: moruli-form postantennal organ, short setae, small mucro without lamellae and the presence of a median hump on abdominal tergum V (Yosii, 1966). Bourgeois & Cassagnau (1972) stated an opinion that the taxonomic status of *C. postantennalis* should be revised considering the low diagnostic value (possible epitokous and ecomorphic changes) of the discriminant features used by Yosii.

Examination of the types of *C. postantennalis* showed that the holotype and two paratypes were conspecific with *Hypogastrura nepalica* Yosii, 1966. This synonymy was confirmed by examination of the *H. nepalica* holotype and paratypes. It was interesting that all the studied *H. nepalica* specimens had a median hump on abdominal tergum V similar to this of *C. postantennalis* in fig. 2A of Yosii (1966). Such a structure was not mentioned in the original description of *H. nepalica* (see Yosii, 1966). Among other paratypes of *C. postantennalis* one adult in bad condition (i.e. without head), 6 juveniles (probably of the first instar) of an unidentified *Ceratophysella* (*denticulata*-group) species and 2 unidentified juveniles of the family Hypogastruridae were found. Some of the *Ceratophysella* juveniles had indistinctly folded postantennal organ, long setae, boat-like mucro and median hump on abdominal tergum V absent.

All the data mentioned suggest that Yosii made the *C. postantennalis* description on the basis of *H. nepalica* and the unidentified *Ceratophysella* specimens. Since the holotype of *C. postantennalis* is *H. nepalica* and the taxonomic status of this last species is sufficiently clear, *C. postantennalis* is synonymized here with *H. nepalica*.

Ceratophysella morula Deharveng & Bourgeois, 1991

Ceratophysella morula Deharveng & Bourgeois, 1991: 308

MATERIAL EXAMINED: Holotype - juvenile male on slide, Thailand, Chiang Mai province, Doi Chiang Dao, 1500 m a. s. l., humus at entrance of a shaft, 21.XII.1980, sample THA31, leg. Deharveng (collection of the Muséum National d'Histoire Naturelle in Paris).

REMARKS

The status of *C. morula* was questioned by Babenko *et al.* (1994). These authors emphasized the low diagnostic value of the characters which distinguish *C. morula* from the related species *C. mosquensis*: the number of finger-like papillae in the postantennal organ, the ratio dens/mucro and the presence/absence of setae a'_2 on the abdominal tergum V. They also suggested that the original description was inaccurate since $1 + 1$ v setae on the head and 2 sublobal hairs on the maxillary outer lobe are unique features in the *denticulata*-group. Examination of the holotype of *C. morula* confirmed some critical comments of Babenko *et al.* (1994), in fact $2 + 2$ v setae and only 1 sublobal hair were visible. Moreover, some other differences between fig. 11 of

Deharveng & Bourgeois (1991) and the real chaetotaxy were noted, for instance the presence of setae p_3 on thoracic tergum II and different lengths of numerous body setae and sensilla. Despite all this, *C. morula* seems to be a good species. From among three subtle characters used by Deharveng & Bourgeois (1991) to distinguish *C. morula* from *C. mosquensis*, the presence/absence of setae a'_2 on abdominal tergum V seems to be reliable. This hypothesis is supported by the results of the study on the taxonomic status of *C. denticulata* (Bagnall, 1941) and *C. engadinensis* (Gisin, 1949) (Skarżyński, 2004). In order to establish the diagnostic value of the remaining characters a study on extensive topotypic material of this species is necessary. The type material of *C. morula* - two juvenile males (holotype - 0.85 mm and 4 + 5 setae on the genital plate) is not suitable for this purpose. Taking this note into consideration one can cautiously expect that the shape of ventral sensilla on antennal segment IV could be a useful feature in diagnostics of the mentioned species (see Tab. 1). *C. morula* is also similar to *C. robustiseta* sp. n. from which it differs clearly in numerous characters presented in Tab. 1.

It is possible that the two populations from Mingbo and Yaral (the Khumbu Himal, East Nepal) recognized as *C. postantennalis* by Yosii (1971) refer in reality to *C. morula*. Examination of respective material from the collection of the Muséum d'histoire naturelle in Geneva (3 adult specimens on slide made by Yosii, Nepal, Mingbo, 299, 3.VI.1961, leg. Janetschek; 12 adult specimens on slides formerly in alcohol, Nepal, Mingbo, 4800 m., 299, 28.V.- 3.VI.1961, leg. Janetschek, det. Yosii; 2 adult specimens on slides formerly in alcohol, Nepal, Yaral, 4100 m., 262, IV.-V.1961, leg. Janetschek, det. Yosii) showed that these specimens generally fit the description of *C. morula*. Nevertheless they clearly differ in the length of setae, *C. morula* has shorter ones. In spite of this it would be premature to regard these Nepalic populations as a new species until more information on the morphological variability of *C. morula* is available.

***Ceratophysella robustiseta* sp. n.**

Figs 1-8

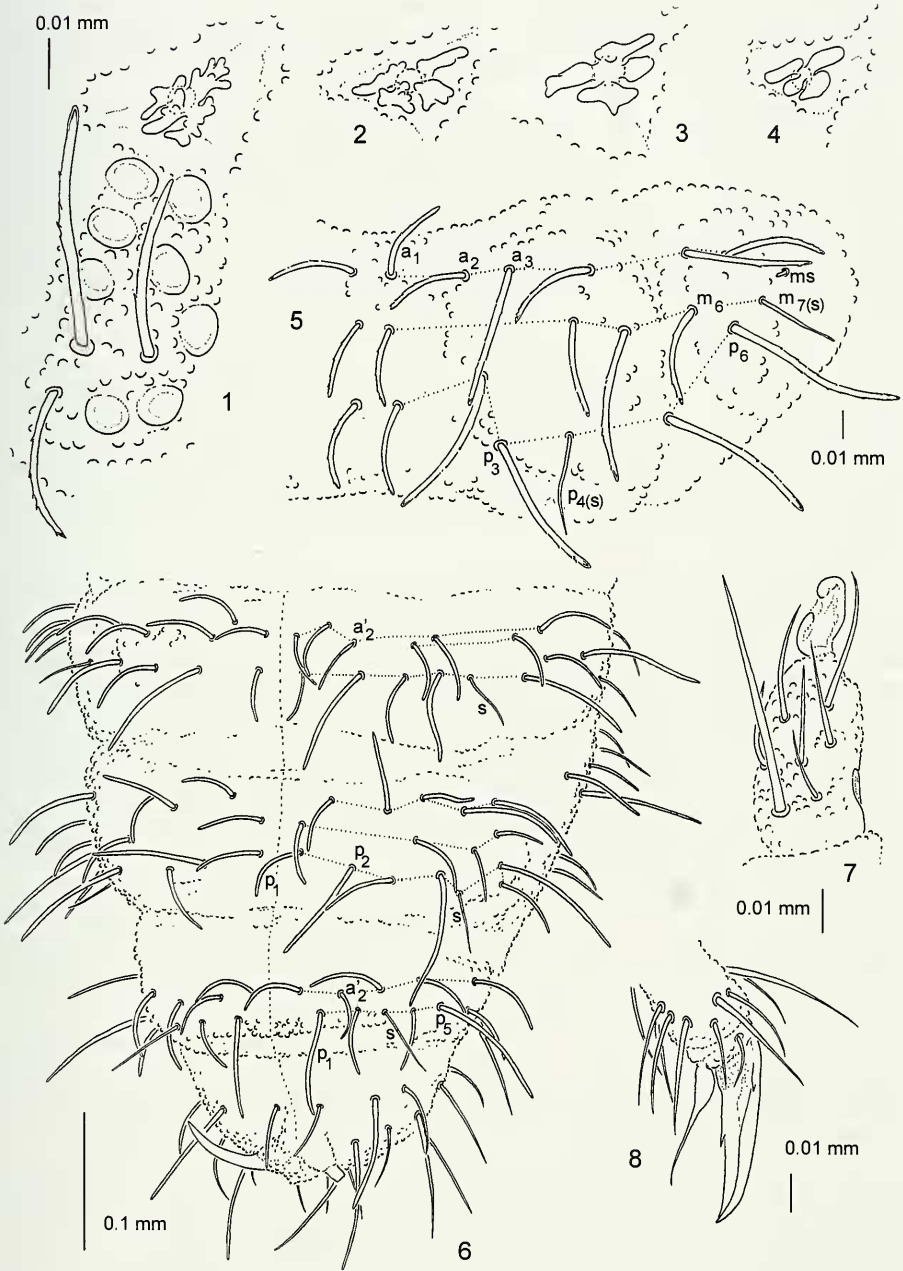
TYPE MATERIAL: Holotype - female on slide, surface of wet mosses near small waterfalls in greenhouses with tropical plants in Kew Gardens (the Evolution House and Princess of Wales Conservatory, London, England), 16. VI. 2003, leg. A. Smolis; paratypes - 12 females, 4 males and 2 juveniles on slides, same data as holotype (type material preserved in the collection of the Department of Biodiversity and Evolutionary Taxonomy, Wrocław University, Poland; one paratype female housed in the collection of the Muséum d'histoire naturelle in Geneva).

ETYMOLOGY: The new species is named after the robust setae on the dorsal side of the body.

DIAGNOSIS: This species is distinguished from other members of the *denticulata*-group by the following combination of characters: eversible sac between antennal segments III-IV absent, antennal segment IV with 10-15 only slightly modified sensilla in ventral file, postantennal organ from almost smooth to weakly moruliform, chaetotaxy with setae a'_2 on abdominal terga I-III and V present, dorsal setae thick abruptly pointed at tips and serrated, empodial appendage with relatively narrow basal lamella

TABLE 1. Morphological differences between species of the *Ceratophysella denticulata*-group having a moruliform postantennal organ.

| Characters | <i>C. robustiseta</i> sp.n. | <i>C. morula</i> | <i>C. mosquensis</i> |
|--|--|---|---|
| Ventral sensilla on antennal segment IV | weakly bent and flattened at tips | weakly bent and flattened at tips | distinctly bent and flattened at tips |
| Eversible sac between antennal segments III-IV | absent | present | present |
| Postantennal organ | from almost smooth to weakly moruliform | moruliform | moruliform |
| Dorsal setae | abruptly pointed at tips, serrated, tips with light external layer | gradually tapered, almost smooth, tips without light external layer | gradually tapered, almost smooth, tips without light external layer |
| Body sensilla | clearly shorter than macrochaetae | little longer than macrochaetae | clearly shorter than macrochaetae |
| Setae a'_2 on abdominal tergum V | present | present | absent |
| Ratio empodium/claws III | ca 0.75 | ca 0.5 | ca 0.5 |
| Ratio dens + mucro/inner edge of claws III | ca 1.5 | 2-2.2 | 2-2.5 |
| Cuticular skeleton of furca | very delicate | strong | strong |
| Mucro | small | large | large |
| Basal macrochaeta on dens | longer than dens | shorter than dens | shorter than dens |



FIGS 1-8

Ceratophysella robustiseta sp. n.: 1, postantennal organ and ocelli; 2-4, postantennal organ; 5, chaetotaxy of thoracic tergum II; 6, chaetotaxy of abdominal terga III-VI; 7, dens and mucro; 8, tibia-tarsus and claw III.

and apical filament reaching about 3/4 of inner edge of claw, furca shortened with very delicate cuticular skeleton, dens with 6-7 unmodified setae, basal macrochaeta longer than dens and mucro small with low lateral lamella.

DESCRIPTION: Body length of males 1.1-1.3 mm, females 1.1-1.5 mm. Body colour greyish-black, paler ventrally. Granulation almost uniform, coarser on last abdominal terga, 6-12 granules between setae p_1 on abdominal tergum V. Dorsal chaetotaxy of thorax and abdomen as in Figs 5-6. Chaetotaxy of head typical for the genus. Dorsal macrochaetae and microchaetae relatively short, thick, abruptly pointed at tips and clearly serrated (Figs 1, 5). Tip of dorsal setae usually with light external layer (Fig. 1). Body sensilla short (ratio $p_3/p_4(s)$ and $p_6/m_7(s)$ on thoracic tergum II = 1.3-1.5 and 1.6-2 respectively), fine and smooth. Setae m_2 on thoracic terga II-III absent, m_6 present. Setae a_3 on thoracic tergum II distinctly longer than a_1 and a_2 . Microsensillum (ms) on thoracic tergum II present. One additional seta present outside lateral sensillum m_7 on thoracic tergum III (see Deharveng & Bourgeois 1991: 309, Fig. 11). Setae a'_2 on abdominal terga I-III usually present. Setae p_1 on abdominal tergum IV microchaetae, p_2 macrochaetae. Abdominal tergum V with 4 + 4 a-setae inside the two p_5 macrochaetae (a'_2 present). Subcoxae I, II, III with 1, 3(4), 3(4) setae respectively.

Antennal segment IV with simple apical vesicle, subapical organite, microsensillum, 6-7 cylindrical, subequal sensilla in typical arrangement (sensilla d sometimes absent) and about 10-15 thin, slightly curved and blunt-tipped sensilla in ventral file. Antennal III-organ with two long (lateral) and two short (internal) curved sensilla. Microsensillum on antennal segment III present. Eversible sac between antennal segments III-IV absent. Antennal segment I with 7 setae.

Ocelli 8 + 8. Postantennal organ about twice as long as diameter of ocellus B, variable in shape. Four primary lobes of postantennal organ with more or less numerous finger-like papillae (Figs 1-3), sometimes without distinct papillae (Fig. 4). Accessory boss invisible.

Labrum with 5, 5, 4 setae and 4 rounded distal papillae. Four prelabral setae. Head of maxilla as in *C. denticulata* (see Fjellberg, 1984). Maxillary outer lobe with 1 sublobal hair. Labium as in *C. denticulata* (see Fjellberg, 1998/1999), with 6 proximal setae.

Tibiotarsi I, II, III with 19, 19, 18 setae respectively, clavate tenent hairs absent (Fig. 8). Claws with distinct inner tooth and two pairs of indistinct lateral teeth (Fig. 8). Empodial appendage with relatively narrow basal lamella and apical filament reaching about 3/4 of inner edge of claw (Fig. 8). Ventral tube with 4 + 4 setae.

Furca shortened (ratio dens + mucro/inner edge of claws III = ca 1.5), cuticular skeleton of furca very delicate, sometimes invisible. Dens with uniform granulation and 6-7 unmodified dorsal setae (basal macrochaeta longer than dens) (Fig. 7). Mucro small, boat-like with low lamellae (Fig. 7). Retinaculum with 4 + 4 teeth.

Anal spines long (about 1.2 as long as claws III), slightly curved, situated on basal papillae (Fig 6). Colour of anal spines more or less yellowish.

DISCUSSION: *C. robustiseta* sp. n. resembles species with a moruliform post-antennal organ such as *C. morula* and *C. mosquensis* from which it differs in the

characters summarized in Tab. 1. Moreover a set of characteristic features: the absence of eversible sac between antennal segments III-IV, the presence of only slightly modified sensilla in ventral file of antennal segment IV, thick dorsal setae, furca shortened with very delicate cuticular skeleton, dens with long basal macrochaeta and small mucro place this species near *C. michalinae* Skarżyński, 2005. Nevertheless it can be easily separated from this species by the following characters (see Skarżyński, 2005): postantennal organ from almost smooth to weakly moruliform (v. smooth), setae a'_2 on abdominal tergum V present (v. absent), empodial appendage with relatively narrow basal lamella and apical filament reaching about 3/4 of inner edge of claw (v. broad basal lamella and apical filament reaching 1/2 of inner edge of claw), 6-7 dental setae (v. 4-7).

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